University of New Hampshire
Technology Transfer Center

Prescriptions From The Salt Doctor

Lessons Learned from Green Snow Pro's

Presenter:
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What's Missing from Green Snow Pro?

- Green Snow Pro in NH
- Brine: A Use Case
- Ground Speed Controlled Spreaders
- Other New Technology (AVL)
- The Weather!
- Chipped Stone for an aggregate?
- Get Ready for Winter

Green Snow Pro in New Hampshire

- Problem Identified with Chloride along I-93
- Workgroup & Steering Committee Established
- Ongoing Water Quality Monitoring by NHDES

Green Snow Pro in New Hampshire

- Established Best Practices for use in New Hampshire
- Develop Training Program Focused on Real World Salt Reduction & Calibration
- 700+ individuals trained
  - Private Sector
  - Municipal
  - State
  - University System
  - Mass Transit Authority

RSA 489-C: Voluntary Certification

- Liability Protection Needed for actual Salt Reductions
- RSA 489-C Provides this protection for Individuals who become voluntary certified
- New Hampshire First in the Nation Legislation to Protect Winter Property Managers!

Good News!

- The symposium counts as your continuing Education Credits!

- Be sure to retain your certificate for your records and for your application next July!

More Good News!

- No Exam today!
- But who remembers the proper % solution for Salt Brine?
- Below what temperature does salt become ineffective?

Give Brine A Try

Brine Maker Tank Side View

1 Overflow Lines

2 Normal Suction

3 Alternate Suction

4 Equalization Line

5 Suction Y-Strainer & Flexible Header

6 Santa

Economic Justification for Brine (Labor)

- Assuming:
  - 20 operators X $30/hr (OT) = $600/hr during a storm
  - Can mobilize 1 hour later and demobilize 1 hour earlier per storm = $1200/storm in labor costs saved
- Assuming 10 winter events per year:
  - **$12,000 savings in OT costs in one winter**

Economic Justification for Brine (Material)

- Brine requires 2.288 lbs of salt/gal = 7 cents/gal (salt at $56.76/ton) => At 50 gal/LM, brine costs $3.50/LM
- Rock salt (at 300 lb/LM) costs $8.50/LM
- Assuming a town has 100LM of primary roadway to treat:
  - Cost per treatment of solid NaCl is $850
  - Cost per treatment of NaCl brine is $350
- Assuming replacement of two treatments of solid NaCl with brine per storm X 10 storms:
  - **$10,000 in material savings in one winter**

Overall Savings

- Potential savings between material and labor:
  - $22,000 in a 10-storm season
- This is in addition to the savings due to:
  - reduced bounce/scatter losses
  - residual effects in an overnight frost condition
  - Liability offset by pro-active anti-icing

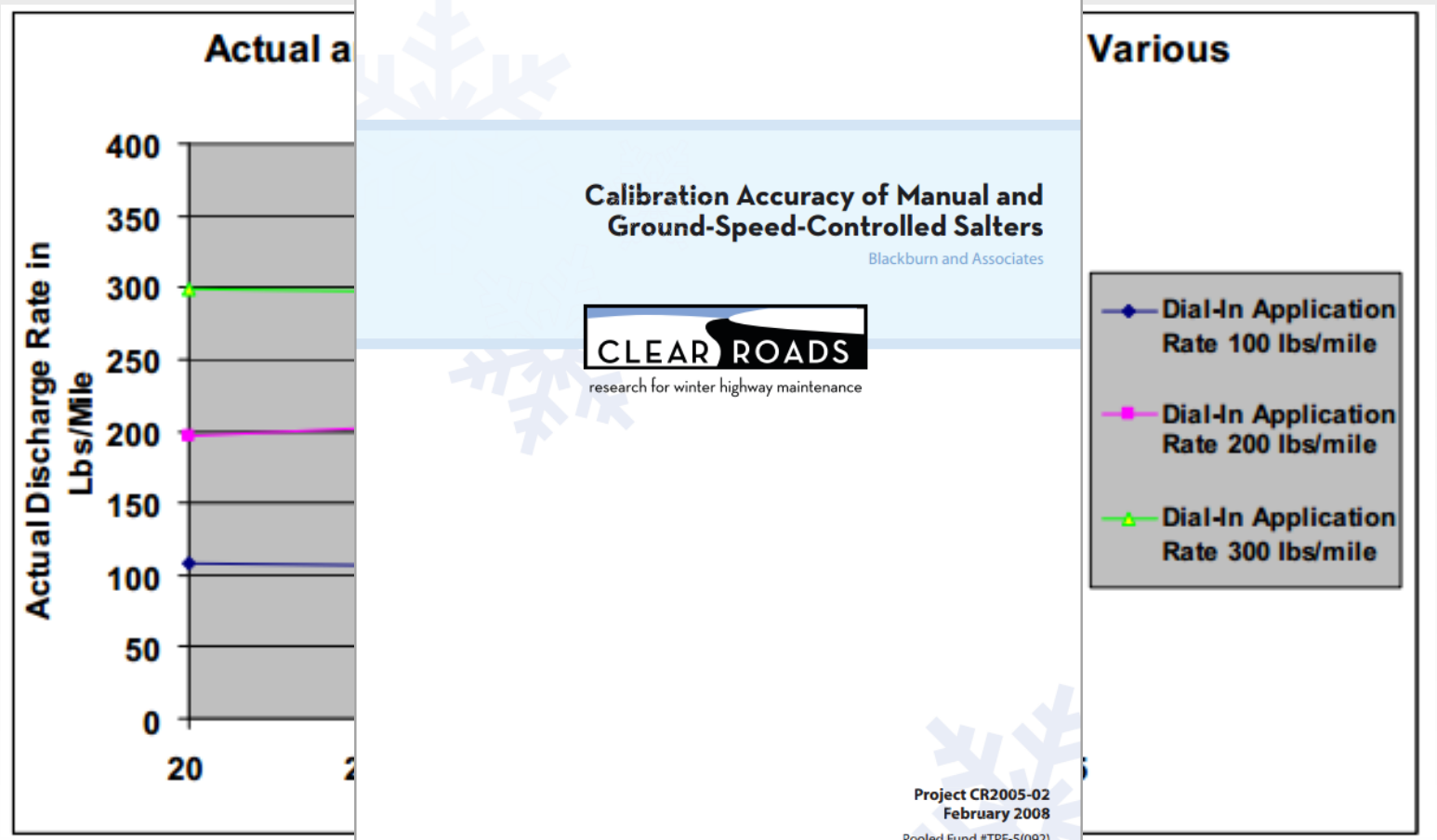
Anti-Icing Challenges

- Managing expectations
- Use the scientific method to experiment
- Prototype units will take a while to build
- Turbulence = brine, anything else = rock salt with water on top (round tanks, multiple pumps?)
- Swapping back and forth from NaCl to CaCl can cause congealing effect
- Need storage capacity, or you are limited to small batch applications

Ground Speed Oriented Spreaders

- Integrated Controller Unit
- Stops Dispensation when Vehicles Stops
- Dial in applicate rate maintained regardless of vehicle speed
- What's the catch?
  - Price?
  - Accuracy?

Dial In Low Range Application Rates



Calibration Accuracy of Manual and Ground-Speed-Controlled Salters

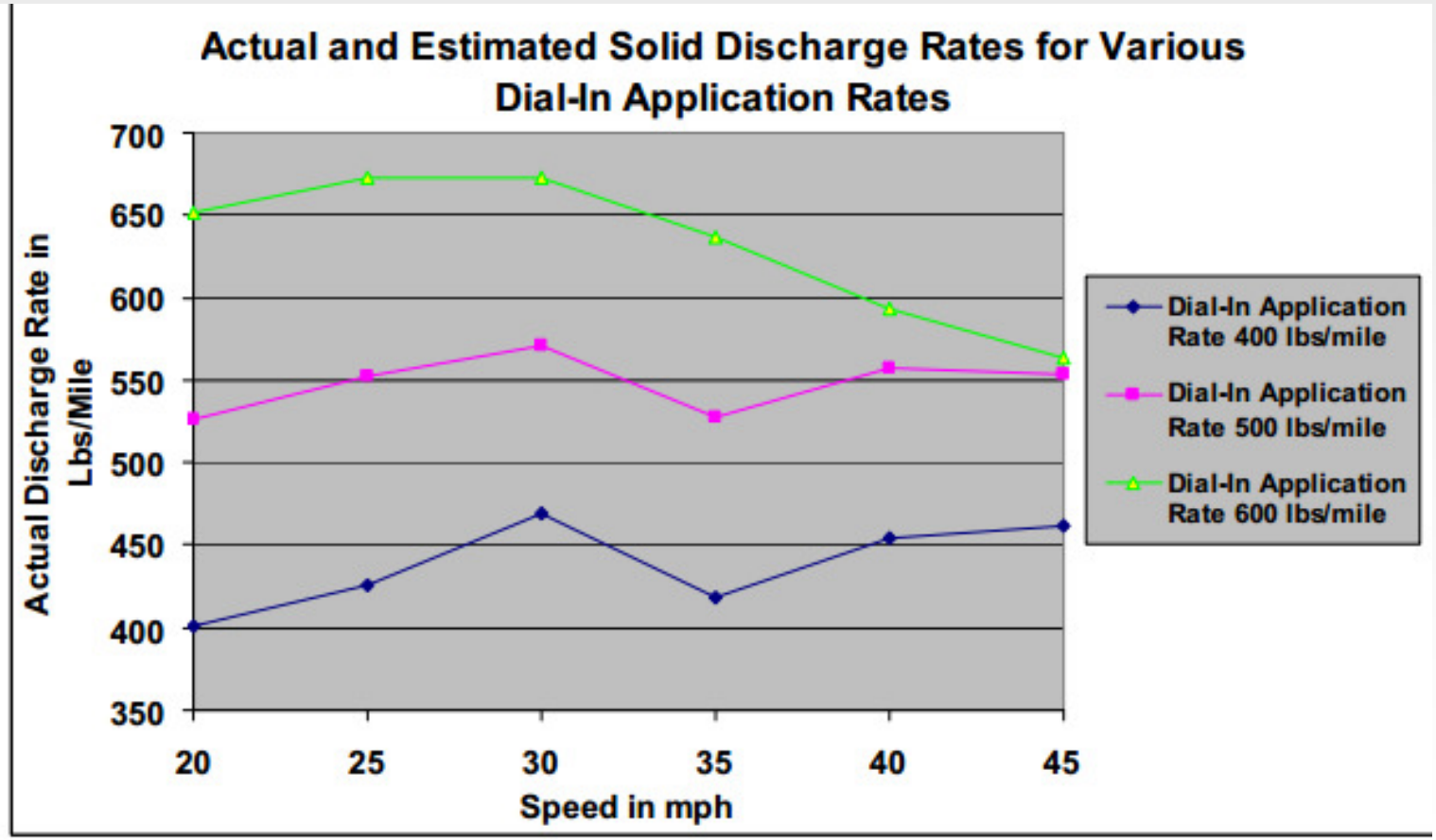
Blackburn and Associates

CLEAR ROADS
research for winter highway maintenance

Project CR2005-02
February 2008

Pooled Fund #TPF-5(092)
www.clearroads.org

Dial in Higher Range Application Rates



Ground Speed Controller in New Hampshire

- NHDOT
- Many Municipalities
- Some Private Sector Folks
- In use for the past 15 years
- Anecdotal Reviews:
  - Some Units have trouble with Very slow speed stop and go
  - Very good for higher speed roads

Calibration of Ground Speed Controlled Units

- Use Manufacturer's recommended Procedures
- Using simpler methods you can test the application rates in your yard
- Drive at a 10, 20, & 30 MPH with a specific rate dialed in
  - After each run sweep up and weigh material to confirm application rate remains the same at variable speeds

Gate Opening	W	A	Discharge Rate (lb/min.)			B	D					
	Spread Width (ft.)	5.28 × W	Run 1	Run 2	Run 3	Average Discharge Rate *((Run1 + Run2 + Run3)/3)*	Pounds of Material Discharged per 1000 square ft. *(D = B × C ÷ A)*					
							5 mph (C = 12)	10 mph (C = 6)	15 mph (C = 4)	20 mph (C = 3)	25 mph (C = 2.4)	30 mph (C = 2)
1”	12	5.28 x 12 = 63.36	70	71	68	(70 + 71 + 68)/3 = 69.67	12 × 69.67/ 63.36 = 13.93	6 × 69.67/ 63.36 = 6.97	4 × 69.67/ 63.36 = 4.64	3 × 69.67/ 63.36 = 3.48	2.4 × 69.67/ 63.36 = 2.79	2 × 69.67/ 63.36 = 2.32
1.5”	11.4	5.28 x 11.4 = 60	92	84	86	(92+84+86)/3 = 87.33	12 × 87.33/60 = 17.47	6 × 87.33/60 = 8.74	4 × 87.33/60 = 5.82	3 × 87.33/60 = 4.37	2.4 × 87.33/60 = 3.5	2 × 87.33/60 = 2.91
2”	11	58.08	106	112	99	105.7	21.83	10.92	7.28	5.46	4.37	3.64
2.5”	10.75	56.76	120	128	129	125.7	26.57	13.28	8.86	6.64	5.31	4.43
3”	10.75	56.76	140	150	143	144.3	30.51	15.26	10.17	7.63	6.10	5.09
EX	14	5.28 × 14= **73.92**	87	92	93	(87+92+93)÷3= **90.67**	12 × 90.67 ÷ 73.92= **14.72**	6 × 90.67 ÷ 73.92= **7.36**	4 × 90.67 ÷ 73.92= **4.91**	3 × 90.67 ÷ 73.92= **3.68**	2.4 × 90.67 ÷ 73.92= **2.94**	2 × 90.67 ÷ 73.92= **2.45**

Fleet Management & AVL

- Real Time Location of Equipment Including Status:
  - Applying Deicer?
  - Plow Down or Up?
- Ability to track vehicle history and time to Reduce Overlap
- Increases efficiency, reduces overlap in material application
  - Up to 30% Material Savings?

The Weather

- Factor's Affecting Precipitation
  - Temperature
  - Dew Point
  - Humidity
  - Pavement/Ground Temperature
- Above factors determine type of precipitation
  - Heavy wet snow
  - Dry light snow
  - Sleet etc.

Heavy snow for some mid-week

Light snow overnight gives way to a mild Tuesday before a big storm moves in Wednesday.

Weather Monitoring

- I'm the Weather Man!
  - Monitor different weather outlets
  - Monitor weather maps
  - Patrol Service Area
- Custom Weather Forecasts
  - Micro-Pattern Analysis
  - Detailed precipitation forecast
  - Current/forecast Pavement Temps
- In Cab Monitoring
  - Pavement Temperature
  - Air Temperature
  - Dew Point/ Relative Humidity

Speaking of Pavement Temperature

- Remember:
  - Pavement Temperatures vary more from air temperature in the evening and morning
  - Pavement Temperature react more slowly to changes than air temperature
  - Air temperature could be 35 – Roadway temperature could be 29 this means Ice!
- After a while aren't we just measure the temperature of the hardpack?

What to do When it's Too Cold for Salt?

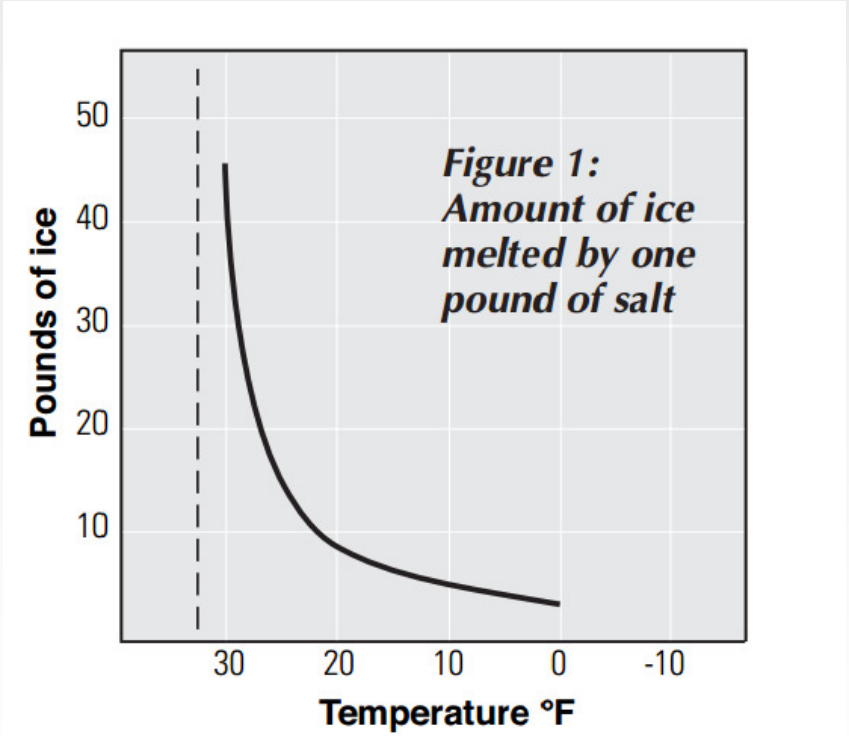
- Abrasive: Winter Sand
  - 10% Salt (if the sand is dry)
  - 50-100lb per cubic yard
- "Hotter" Sand Salt Mix?
  - <u>If the goal is traction</u>
    - Scenario A: The salt melts some snow this makes muddy slush which provides no traction
    - Scenario B: It's too cold to melt… why use salt at all?
  - <u>If the goal is melting & removal</u>
    - The salt melts the Ice, the plow removes sand/salt

Other Abrasive Details

- Larger diameter angular particles are more effective:
  - Smaller than 3/8” diameter to reduce damage to windshields
  - Custom mixes of stone dust and small gravel can be very effective
  - Small diameter particles/dirt actually reduce traction
- Not appropriate on high speed or heavily trafficked roads
- Not appropriate when they will be covered with snow or immediately plowed off

Remember How Salt Works

- Salt Becomes Ineffective below 15°F
- Below 15°F
  - Switch to alternative chemicals
    - Magnesium Chloride 5°F
    - Calcium Chloride -20°F
    - Non Chloride
      - Potassium Acetate -23°F



Get Ready for The Winter Season

- Calibrate your equipment
- Inspect the sites you will be maintaining
- Enjoy the rest of the symposium!